OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D.C. 20301

November 18, 1970

MEMORANDUM FOR THE CHAIRMAN, DEFENSE SCIENCE BOARD

Subject: AEGIS Issues, as seen by the Defense Science Board Task Force on Tactical Navy R&D Issues

1. INTRODUCTION

We have examined the major issues of the AEGIS Program and have come to some conclusions. This Memorandum is an attempt to summarize the views we now hold. In writing down these views, we are conscious of the fact that this Task Force has not examined in as much depth all of the complex historical, technical and legal problems that must be considered in charting a course as have the OPNAV and CNM offices that have cognizance over the program. Nevertheless, we believe we have focused on the significant issues and have come to conclusions that should be considered in decisions pertaining to the AEGIS Program.

Issues we have considered in varying depth of detail are given below:

Can the cost of AEGIS be reduced significantly?

Should we provide area defense or should we concentrate on point defense for most of our ships?

Will AEGIS be able to provide area defense to a task force?

Do the technical risks warrant a revision of the program?

Can a reduced version of AEGIS be used as the missile system on other than DLGN-38 class ships we must build in the 80's to maintain our SAM ship force levels?

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2. AEGIS COST

The per ship cost of the AEGIS Missile System is stated to be in excess of $50M with a strong likelihood that these costs will grow further (principally in the MFAR radar and computer areas). About $24M of the cost is due to the MFAR radar. By comparison the entire TARTAR-D is said to cost about $24M.

It seems evident to us that at this cost (and weight), AEGIS could not be a suitable successor to our 3-T family on new construction ships built in the 80's to replace our 70 plus missile ships.

Assuming a 25 year ship life and a force level of 75 missile ships, we must build some 3 missile ships per year and we must also retrofit a like number each year. Actually, because of the old age of our present hulls, we must build missile ships at a higher rate now. It is doubtful that we could afford this many ships even with a scaled down AEGIS.

The ongoing "simplification program" may have merit in several respects, but it does not significantly reduce the cost of the program and, therefore, is not likely to alter our conclusion given in the second paragraph of 2. It remains our conclusion that AEGIS costs, if anything, will grow.

While MFAR is a technologically elegant solution to the multiple radar requirements of AEGIS, to perform the radar functions of AEGIS we do not see a compelling reason to use an MFAR phased array radar. Long range air search capability could be satisfied with a rotating antenna radar. Midcourse missile command guidance data rates do not require MFAR, nor does terminal guidance illuminator aiming against long range targets. The shorter ranges could be covered by a separate high data rate pulse doppler radar. We believe that the cost of MFAR exceeds the sum of the costs of the several more conventional radars that would be needed to perform these functions.

3. AREA VS. POINT DEFENSE AND AEGIS CAPABILITIES

We find that the Navy's concept of area defense as embodied, in principle, in our present systems is still a valid concept in many scenarios. Area defense consists of AEW aircraft and long range shipborne air search radars all feeding a command and control system (which should

receive information from all sources - as was done in the PIRAZ ships). In this way area surveillance is maintained. Airborne interceptors with standoff missiles (like PHOENIX) provide long range intercept capability against enemy aircraft weapon delivery platforms (or against long range missiles). Long range ship launched missiles (like TALOS) augment this area denial capability of the Task Force. Ships with short or medium range missiles provide for their point defense and for the defense of ships in their immediate vicinity. Short range missiles and guns complete the last line of self-defense of individual ships of the force. In this defense in depth concept, the area defense role of AEGIS is intended to deny a free ride to the enemy in areas not covered by the point defense of other missile ships, and AEGIS is intended to provide a protective umbrella over the carriers.

We have doubts that AEGIS will in fact be able to fulfill this role, or that the MFAR radar (the principal item responsible for AEGIS cost) is in fact needed for this role. If we could be convinced on these two issues, we would support the continued development and procurement of very small quantities of AEGIS systems despite the very high cost of the system.

We feel, however, that lack of a long range missile (like TALOS), the doubtful ability of MFAR to track low altitude crossing targets needed in area defense, and our inadequate low altitude fuzing state-of-the-art cast serious doubt on the ability of AEGIS to satisfy the area defense role satisfactorily. We recognize that the fuze deficiency is common to all our present missiles. These doubts would remain even if MFAR did not suffer from technical development problems, problems that will be discussed later.

We recognize that providing a point defense capability for each ship is an alternative to area defense, particularly when airborne interceptors with standoff missiles would provide a limited area defense capability anyhow. However, we feel that the protection of high value targets against coordinated multiple missile and aircraft attacks from longer ranges requires the use of a long range high rate-of-fire area defense system to reduce the burden placed on the point defense systems.

4. TECHNICAL RISKS AND PROGRAM SCHEDULE

The MFAR radar and the computer software are the two major technical risks in the development, and lack of suitable targets is a risk in the testing of AEGIS.

The originally considered transmitter tube is a high risk item that has experienced serious development difficulties. The back-up tube, which is now the prime tube, represents a less desirable transmitter design. The per ship annual tube replacement expenditure might be in excess of a million dollars if the cost and life-time specifications for the tube are not met. For these reasons, we feel that proceeding with the transmitter on the present schedule forces RCA to make premature and undesirable choices that will come to haunt us in a year or so. Tube development lags the program to an extent sufficient to consider stretching out the transmitter development if contractual considerations permit it.

The EDM-1 Program is essentially paid for. It should be tested adequately to critically evaluate AEGIS potential to fill an area defense role in an ECM environment against multiple low altitude raids against protected (not own ship) targets and multiple varied-altitude, medium and long range targets. We believe that properly equipped supersonic targets are not available for these tests either in quantity or in kind and are not provided for in planning. While it is recognized that providing these targets is not the responsibility of the AEGIS Program, the statement is nevertheless true. Since the justification of the program hinges critically on whether or not AEGIS can provide area defense, testing these characteristics must weigh heavily in any production decision.

The pressures on the program to make an affirmative production decision at EDM-1 test may force a premature decision which can be extremely costly later on. For this reason, it is important to take adequate time to reach a production decision and to alert RCA early of this intention so that they could plan for the engineering personnel reallocations that may be necessary. We cannot emphasize enough our concern about the danger of a premature production decision.

5. SCALING DOWN AEGIS FOR SMALLER MISSILE SHIPS

We have considered several approaches to provide a TARTAR-D update suit for missile ships intended to replace the majority of our present 3-T ships. We do not see a scaled down version of AEGIS as a suitable solution. It's capabilities would be reduced significantly while it's cost would not be. We feel that a study leading to a recommendation on the nature of such a missile system should be made and that the study should include a ceiling per unit target cost as part of its ground rules. While we do not wish to invent a TARTAR-E in committee, we believe that a low-cost solution would not contain even a scaled down MFAR. If this turns out to be true, one must ask whether it is worth building AEGIS (MFAR) anyhow? We do not feel we have a conclusive answer to this question, but we are leaning toward a yes answer.

6. SUMMARY

- We feel that AEGIS costs will be $50M or more.
- At this cost, we can afford only a few AEGIS ships.
- AEGIS cannot be cut down in cost without significant performance degradation without eliminating the MFAR radar which is responsible for half the system cost.
- The majority of our future missile ships will have to be TARTAR-D updates, not AEGIS derivatives, to be able to afford them.
- The test program has inadequate air target support to permit the crucial area defense testing. Since the EDM-1 Program is essentially paid for, it should be tested adequately.
- The transmitter tube development problems may require a program stretchout to avoid undesirable transmitter designs. This would present contractual problems. In any case, tube development should be closely watched.

- The lack of a long range missile (like TALOS) in AEGIS-equipped Task Forces cast serious doubt on the ability of the Task Forces to adequately satisfy the area defense role.

- We caution against hasty production decisions.

George Sebestyen

George S. Sebestyen
Chairman, Defense Science Board
Task Force on Tactical Navy
R&D Issues

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OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

15 April 1971

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MEMORANDUM FOR: **Mr. Carl E. Duckett, Deputy Director for Science & Technology**
Central Intelligence Agency

The next meeting of the Defense Science Board Ocean Surveillance Task Force will be held Thursday and Friday, 29-30 April 1971, at the Institute for Defense Analyses (IDA), 400 Army-Navy Drive, Arlington, Va. The meetings will begin at 0900 each day in the IDA "Tank", Room 4C25.

Parking has been reduced in the vicinity and attendees are urged to use taxis or the IDA Shuttle Bus from the Pentagon (Platform C-5) as much as possible. Tell the driver of the Shuttle Bus that you are going to a meeting in the "Tank".

If necessary to drive, use the P-2 and P-3 parking areas in the garage or, if nothing is available, the IDA outside parking. Do not use the bank parking directly across from the front entrance - it is a "tow-away" zone.

All panel members are urged to be prompt for the first session, 0900 Thursday. There will be a final review of the panel reaction to the Navy report as the first order of business.

D. L. Jarrell
Captain, U.S. Navy
Executive Secretary
Ocean Surveillance Panel

15 April 1971

Ocean Surveillance Panel
Agenda
29-30 April 1971

Thursday, 29 April 1971

0900 - 0930	Executive Session
0930 - 1100	History of AGER/TRS Operations - Capt. Ince (NSG)
1100 - 1200	Navy/DOD Organization - OSD (A)
1200 - 1300	Lunch/Executive Session
1300 - 1515	Exercise Admixture - VADM Peet (Com, 1st Fleet)
1515 - 1615	Submarine Tactical Communications - Cdr. Donovan (OP 201G)
1615 - 1700	Executive Session

Friday, 30 April 1971

0900 - 0930	Executive Session
0930	Bus to NPIC
1000 - 1200	NPIC Brief and Visit
1200	Bus to IDA
1230 - 1330	Lunch/Executive Session
1330 - 1430	Foreign Hydro Acoustic Devices - Cdr. Burkhalter (OP 942U)
1430 - 1500	Tactical Warning Panel - Lt. Col. Henderson
1500 - 1700	Executive Session

Meeting at IDA - in the "Tank" - 4C25